fiber channel (1250), and then maintaining control of the loop (1250) as long as a predetermined minimum amount of data is available within control of the node. This reduces arbitrated-loop overhead by reducing the number of times in which the node interface (1220) must relinquish control of the port, only to have the data needed arrive soon thereafter and then having to re-arbitrate for control of the loop (1250).

It is to be understood that the above description is intended to be illustrative, and not restrictive. Although numerous characteristics and advantages of various embodiments of the present invention have been set forth in the foregoing description, together with details of the structure and function of various embodiments, many other embodiments and changes to details will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled.

What is claimed is:

1. A communications channel system for reducing arbitration overhead comprising:

a first channel node having a first port and a second port, each port supporting a fiber-channel arbitrated-loop serial communications channel, wherein each one of the ports arbitrates for control of that port's attached communications channel; and

an arbitration-and-control apparatus to reduce arbitrated-loop overhead, wherein the arbitration-and-control apparatus arbitrates for control of a loop of the communications channel and, after control is achieved, maintains control of the communications channel as long as at least a first predetermined amount of data is available within control of the channel node, wherein the first predetermined amount of data within control of the channel node includes at least some data not available for transfer to the communications channel.

2. The system according to claim 1, further comprising:

a channel-node circuit chip, the chip having an on-chip data buffer, wherein the first predetermined amount of data includes a predetermined amount of on-chip data within the on-chip data buffer currently available for transfer to the communications channel; and

an off-chip memory, wherein the first predetermined amount of data further includes a predetermined amount of off-chip data, which is to be transferred to the communications channel but is currently not available for transfer, within the off-chip memory that is distinct from the predetermined amount of on-chip data.

3. The system according to claim 2, wherein the predetermined amount of on-chip data includes a programmable amount of data.

4. The system according to claim 2, wherein the predetermined amount of off-chip data includes a programmable amount of data.

5. The system according to claim 2, wherein the predetermined amount of on-chip data includes a programmable amount of data, the predetermined amount of off-chip data includes a programmable amount of data, and the predetermined amount of off-chip data is a different amount than the predetermined amount of on-chip data.

6. The system according to claim 5, further comprising:

a magnetic-disc-storage drive operatively coupled to the first channel node; and

a computer system having a second channel node, wherein the second channel node is operatively coupled

to the first channel node in a fiber-channel loop in order to transfer data between the first and second channel nodes through the fiber-channel arbitrated-loop serial communications channel.

7. The system according to claim 1, further comprising:

a magnetic-disc-storage drive operatively coupled to the first channel node; and

a computer system having a second channel node, wherein the second channel node is operatively coupled to the first channel node in a fiber-channel loop in order to transfer data between the first and second channel nodes through the fiber-channel arbitrated-loop serial communications channel.

8. The system according to claim 1, wherein

the arbitration-and-control apparatus, for at least one transfer operation, delays the start of the transfer operation until after a second predetermined amount of data is available for transfer.

9. The system according to claim 1, further comprising:

a channel-node circuit chip, the chip having an on-chip data buffer; and

an off-chip memory operatively coupled to supply data to the channel-node circuit chip, wherein the communications channel is an fiber channel arbitrated loop, and the loop is held open if at least one-half a frame of data is contained in on-chip data-frame buffer, and at least one frame of data are contained in off-chip memory.

10. A disc drive comprising:

a rotatable disc;

a transducer in transducing relationship to the rotating disc;

a channel node having a first port and a second port, each port supporting a fiber-channel arbitrated-loop communications channel, each communications channel including a cyclic-redundancy code within data transmissions on the communications channel, the channel node operatively coupled to the transducer to communicate data; and

an arbitration-and-control apparatus operatively coupled to the channel node to reduce arbitrated-loop overhead, wherein the arbitration-and-control apparatus arbitrates for control of a loop of the communications channel and, after control is achieved, maintains control of the communications channel as long as at least a first predetermined amount of data is available within control of the channel node, wherein the first predetermined amount of data within control of the channel node includes at least some data not available for transfer to the communications channel.

11. The disc drive according to claim 10, further comprising:

a channel-node circuit chip within the channel node, the chip having an on-chip data buffer, wherein the predetermined amount of data includes a predetermined amount of on-chip data within the on-chip data buffer currently available for transfer to the communications channel; and

an off-chip memory, wherein the predetermined amount of data further includes a predetermined amount of off-chip data, which is to be transferred to the commu-

nications channel but is currently not available for transfer, within the off-chip memory that is distinct from the predetermined amount of on-chip data.

12. A communications method comprising steps of:

(a)(I) arbitrating for control of a loop of a fiber-channel arbitrated-loop serial communications channel; and

(b) maintaining control of the loop of the communications channel as long as a first predetermined minimum amount of data is available within control of the channel node, wherein the first predetermined amount of data within control of the channel node includes at least some data not currently available for transfer to the communications channel, whereby arbitrated-loop overhead is reduced.

13. The method according to claim 12, wherein the maintaining step (b) further includes steps of:

(b)(I) determining an on-chip amount of data available in a channel-node circuit chip;

(b)(ii) determining an off-chip amount of data available in an off-chip memory; and

(b)(iii) comparing the on-chip amount of data available to a predetermined minimum-required amount of on-chip data;

(b)(iv) comparing the off-chip amount of data available to a predetermined minimum-required amount of off-chip data; and

(b)(v) maintaining control of the loop based on these comparisons.

14. The method according to claim 13, wherein the maintaining step (b) further includes a step of

(b)(vi) programmably changing the predetermined minimum-required amount of on-chip data and the predetermined minimum-required amount of off-chip data.

15. The method according to claim 13, wherein the maintaining step (b) further includes a step of

(b)(vii) programmably changing the predetermined minimum-required amount of off-chip data to a different amount than the predetermined minimum-required amount of on-chip data.

16. The method according to claim 13, wherein the maintaining step (b) further includes a step of

(b)(viii) programmably changing the predetermined minimum-required amount of off-chip data.

17. The method according to claim 12, further comprising a step of

(c) transferring data through the fiber-channel arbitrated-loop serial-communications channel between a magnetic-disc-storage drive that is operatively coupled to the first channel node and a computer system having a second channel node, wherein the second channel node is operatively coupled to the first channel node by the fiber-channel arbitrated-loop serial-communications channel.

18. The method according to claim 12, further comprising a step of

(d) beginning a transfer operation only after a second predetermined amount of data is available for transfer.

19. A fiber-channel node controller system for reducing arbitration overhead comprising:

a first channel node having a first port and a second port, each port supporting a fiber-channel arbitrated-loop serial communications channel, each communications channel including a cyclic-redundancy code within data transmissions on the communications channel; and

arbitration-and-control means for arbitrating for control of a loop of the communications channel and, after control is achieved, maintaining control of the commu-

nications channel as long as at least a first predetermined amount of data is available within control of the channel node, wherein the first predetermined amount of data within control of the channel node includes at least some data not available for transfer to the communications channel, thus reducing arbitrated-loop overhead.

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